

A. Defense Technology Transfer

The Office of Technology Transition (OTT) has oversight for the Defense Department programs supporting technology transfer and discussed in this report. These programs are consolidated into one office to ensure cohesion and synergy in implementation. As we've encouraged the Military Departments to look at these programs as parts of a whole, they have started integrating them and are now organizing so that these programs are key parts of their technology transfer efforts.

This is the ninth report on the activities of the OTT. In this report we are providing more detailed data on activities across the Department in technology transfer than we have provided in the past. By providing this level of detail, we anticipate the broad scope of technology transfer efforts can be seen. This particular report is structured to show the Defense Committees some statistical data on utilization of federal technology transfer mechanisms. We have attempted to provide an explanation of the our technology transfer program for FY 2001 and the DoD plans for conducting its technology transfer function in FY 2002, including its plans for securing intellectual property rights in laboratory innovations with commercial promise and plans for managing its intellectual property so as to advance the agency's mission and benefit the competitiveness of United States industry.

Specific statistical data elements are included as Appendix C. These give an indication of the level of activity in certain areas such as Cooperative Research and Development Agreements (CRADAs) and patenting and licensing. However, they do not give the most definitive picture of how the Defense Department is using the tools of technology transfer to enhance our mission capabilities, increase partnerships and joint development activities with the private sector, nor the ways we have been able to use these tools to varying degrees at our different locations. These benefits to the Defense Department are reflected in the success stories on pages 6-9 and in Appendices D and E of this report.

The Department of Defense (DoD) Technology Transfer Program is implemented through a decentralized process. Each Military Service and participating Defense Agency has implementing guidance, Offices of Research and Technology Application (ORTAs), and patent attorneys located at various sites with appropriate authority to transfer technology both into and out of the laboratory. In FY 01, DoD had over 100 ORTAs and patent attorneys throughout the Military Services and Defense Agencies involved in the transfer of technology to enhance both our mission capabilities and the economic competitiveness of U.S. industry. While this decentralized approach allows the local technology transfer processes, procedures, and projects to fall within the specific mission-related activities of the local laboratories, there is overarching DoD guidance in place to ensure common policy and objectives.

DoD Technology Transfer Program in FY 2001

DoD is one of the few Federal Departments investing in technology Research and Development (R&D) for its own use. We are the primary customers of the technology being developed in our laboratories and through contracts for military items. Therefore, technology transfer is viewed as a way to enhance mission capabilities. We can develop technology and spin out to the commercial sector for consumer items, find technology in the commercial sector for military use, and jointly develop technology for both military and commercial applications.

Appendix C contains a spreadsheet identifying the numbers of CRADAs, both new in FY 2001 and continuations from previous years, invention disclosures and patents, and income from active patent license agreements.

The Annual Report to Congress for FY 2000 required by 10 U.S.C. 2515 identified the number of active patent license agreements and royalty income to the Defense Department based on a study, "Patent Marketing and the Value of Licensing to DoD Laboratories." Consistent with that report, the numbers for FY 2001 show the total royalty income to DoD is just over \$6 million. The royalty income at most of our laboratories/centers does not cover the cost of payments to the U.S. Patent and Trademark office to obtain and maintain DoD patents. Royalties generally are not used to cover this expense. Royalty fees are used to 1) provide incentives, both the individual share of the royalty to inventors as well as cash awards to technical teams, and 2) provide for further R&D consistent with the R&D mission of the laboratory.

If the primary measure of effectiveness used to assess patent program success is the amount of royalty revenue brought in, then the bottom line is that the vast majority of patent programs at DoD laboratories currently do not pay for themselves, nor are they likely to do so in the future. However, we believe it is important to protect our internally developed intellectual property and make it available for use via licensing or other appropriate mechanisms.

While the heart of technology transfer is intellectual property, the technology transfer program at DoD includes more than patenting and licensing activities. Each of our laboratories has implemented technology transfer programs to support its unique laboratory mission requirements. During FY 2001 we have used a wide degree of latitude in deciding and defining what works best at our different locations. Appendix D provides some highlights from some of the laboratory locations to illustrate the variety of activities, technologies, and capabilities that are part of the DoD Technology Transfer Program.

Some of the areas in which we have been working in FY 2001 include the following groups, projects, and systems. FY 2001 major successes are identified at the end of this section.

Defense Technology Transfer Working Group (DTTWG)

The DTTWG was established in 1994 and is comprised of representatives from each of the Military Departments and most of the Defense Agencies. This group meets monthly to review technology transfer issues requiring either consistent policy or approach from a joint DoD perspective. Two of the areas addressed this year are:

- Data collection requirements for current and anticipated requests – this will continue through FY 2002
- General Accounting Office and Interagency reviews of technology transfer mechanisms and programs

Technology Transfer Mechanisms

Technology Transfer mechanisms are important to strategic planning at the laboratories to enable spin-off, spin-on, and dual use development of technologies. They provide a variety of tools with the potential to leverage outside resources and, potentially, reduce the development and acquisition cost of technology products. DoD would like to buy better capability at reduced costs and one way to do this is the use of technology transfer mechanisms.

The combined number of technology transfer activities in FY 2001 is identified in Appendix B; however, these are limited to Cooperative Research and Development Agreements (CRADAs), Patent License Agreements (PLAs), Facility Use Agreements, Personnel Exchange Agreements, and some of our Educational Partnership Agreements (EPAs).

DoD has been very active in the use of EPAs. We recognize that our future scientists and engineers are today's students needing both faculty resources and equipment to test scientific knowledge. We have a significant number of formal EPAs with universities and community colleges as well as local public school districts to provide the needed support in the form of technical assistance, personnel exchange, and loan/donation of educationally useful laboratory equipment.

DoD Technology Transfer Integrated Planning Team (TTIPT) Workshop

The sixth DoD TTIPT Workshop was held in November 2001. One hundred technology transfer professionals gathered to discuss joint projects, best practices, lessons learned, and to hear about new legislation and information sources that will effect current technology transfer efforts. Each Military Department provided an update on its technology transfer program implementation, the DoD partnership intermediary (TechLink) discussed how they are supporting technology transfer activities, training sessions on our proposed intellectual property database and technology assessments were presented, legal issues were discussed, and information sources currently available were highlighted (Defense Technology Transfer Information System, Virtual Technology Exposition). Additionally, roundtable discussions were held on four topics: usefulness of the Federal Laboratory Consortium, Database modules for intellectual property management, balancing the need for security with technology transfer functions, and DoD policy committee.

Interagency Working Group on Technology Transfer (IAWG/TT)

The three Military Services and DoD continue to participate with the other Federal Departments and Agencies on the IAWG/TT chaired by the Department of Commerce. This working group has looked at technology transfer implementation in the various federal departments, how it varies based on Agency mission, and what we can learn from each other to improve our programs. It is continuing a review of foreign partners in CRADAs and how to assess potential concerns arising in these relationships. The IAWG/TT has proven to be an effective mechanism for discussions among the Federal Departments and Agencies and for identifying ways to showcase success in technology transfer activities.

Federal Laboratory Consortium

The Military Departments and Defense Agencies have been participating in the Federal Laboratory Consortium for Technology Transfer (FLC) since its inception in 1974. Participation is achieved through financial support, participation in annual National FLC meetings, serving as FLC Executive Board members and/or Committee Chairs, and actively supporting interagency laboratory projects. The FLC provides an opportunity to share information with other Federal Agency technology transfer professionals and learn about methods employed in other agencies that could benefit DoD.

The FY 2001 DoD financial payment for the operation of the FLC as specified in 15 USC 3710(e)(7)(A) was \$959,366. We plan to work closely with the FLC to ensure DoD obtains value for this investment.

The FLC presents Annual Awards for Excellence in Technology Transfer to recognize laboratory employees who have done outstanding work in the process of transferring lab-developed technology. Nominations are made by the laboratory representatives and are judged by a panel of experts in the field of technology transfer. The FY 2001 Department of Defense winners of the Award for Excellence in Technology Transfer are identified along with a description of their technology in Appendix E. Additionally, Appendix E identifies both the FLC Representative of the Year, Ms. Kristen Schario, and Laboratory Director of the Year, Mr. Philip Brandler, from DoD laboratories.

DoD representatives serve in both elected and nonelected positions with the FLC. These leadership functions facilitate sharing of information with other Federal Departments and Agencies and contribute to specific technology transfer activities. The following DoD personnel hold positions in the FLC:

FLC Position	Name/Organization
FLC Vice Chair Chair, Planning and Policy Committee Chair, Nominating Committee	Ed Linsenmeyer, Naval Surface Warfare Center, Coastal Systems Station
Chair, Program Committee	Norma Cammarata, Army Research Laboratory
Chair, Training Committee	John Griffin, Army Topographic Engineering Center
Chair, Legal Issues Committee	Vin Ranucci, Army Soldier Systems Command
Recording Secretary	Geoff Phillips, Defense MicroElectronics Activity
Coordinator, Northeast Region	Louis Jakub, Army Communications and Electronics Command
Coordinator, Mid-Atlantic Region	Richard Dimmick, Army Research Laboratory (Aberdeen)
Coordinator, Southeast Region	Kelly McGuire, Army Aviation and Missile Command RD&E Center
Coordinator, Far West Region	Michael Sullivan, Naval Air Warfare Center, Weapons Division, Point Mugu
Deputy Coordinator, Northeast Region	Hans Kohler, Naval Air Warfare Center, Aircraft Division
Deputy Coordinator, Mid-Atlantic Region	J. Scott Deiter, Naval Surface Warfare Center, Indian Head Division
FLC Executive Board Member-At-Large	Sharon Borland, Army Cold Regions Research and Engineering Laboratory
FLC Executive Board Member-At-Large	Soheir Ibrahim, Army Yuma Proving Grounds
FLC Executive Board Member-At-Large	Mary Weiss, Defense Technical Information Center

In addition to the above positions, Mr. John Todaro, Director, Office of Technology Transition, Office of the Deputy Under Secretary of Defense (Science and Technology) is serving on the National Advisor's Board to the FLC.

Defense Technology Transfer Information System (DTTIS)

The Defense Technical Information Center (DTIC) maintains the DTTIS in cooperation with the Military Services and Defense Agencies. As of December 31, 2001, we had 2,293 active CRADAs and 156 active Patent License Agreements. Numerical data from DTTIS is available at Appendix B.

The Technology Transfer Commercialization Act of 2000 was signed into law on November 6, 2000, providing additional guidance on licensing of federally owned inventions and CRADAs. It also requests specific data on utilization of federal technology. The specific data required to respond to this request were not collected by the Defense Department in any consolidated, automated way. This reporting requirement highlighted our need to better manage the intellectual property (IP) owned by DoD. We have begun to design an Intellectual Property Management Information System (IPMIS) to provide the requested information and help manage our IP. IPMIS should provide the data in a manner consistent with the request and should allow for easy transition into the DTTIS for these new data elements. We began this effort in FY 2001 and anticipate initial capability in FY 2003.

DoD Partnership Intermediary: TechLink

DoD began sponsorship of TechLink in July 1999. TechLink is a program established at Montana State University in Bozeman, Montana, to facilitate DoD technology transfer between companies in the TechLink region and all the DoD laboratories for development, transfer, and commercialization of new technologies. TechLink focuses on industries important to its region. The TechLink region includes Montana, Oregon, Washington, Idaho, Utah, Wyoming, North Dakota, and South Dakota.

The industry focus in the TechLink region is on Advanced Materials, Aerospace, Agriculture, Biomedicine and Biotechnology, Electronics, Environmental Technologies, Software and IT, and Photonics and Sensors. TechLink's accomplishments include assistance to approximately 70 different companies, assisted in creation of 6 new companies, and facilitated over 15 patent license agreements between companies and DoD laboratories in FY 2001.

TechLink success is measured on the outcome of its transactions. One metric is the number of partnerships facilitated between DoD and the private sector in the TechLink region. These have increased over the past year and TechLink has proved beneficial in finding partners for technology transfer purposes, both within the federal laboratory system and in the private sector.

Website



TechTRANSIT is the gateway to DoD technologies promoting partnering opportunities between the private sector and Defense laboratories. The website address is <http://www.dtic.mil/techtransit>. This website provides information of interest to the technology transfer community and includes contact information on ORTAs in the Military Services and Defense Agencies.

Major Successes in FY 2001

The following specific successes are examples of the type of technology transfer efforts within the DoD community.

ARMY

Walter Reed Army Institute of Research (WRAIR)

Testing of tafenoquine, an antimalarial drug developed at WRAIR, began in pediatric populations

First WRAIR CRADA where an Army officer has been assigned a temporary duty station (1 year) in the private sector and is provided space, equipment, and supplies to carry out the Statement of Work

Glaxo SmithKline has licensed all of WRAIR's technology on Live-Attenuated Dengue Vaccines and initiated a CRADA with WRAIR to identify the most suitable live virus tetravalent combination to produce a vaccine for commercial use.

WRAIR entered into a unique licensing arrangement with a spin-off company, Iomai. The technology license is a technique that allows the transdermal delivery of vaccines and drugs by application of the materials to bandages and replaces the requirement to use needles for delivery.

Army Medical Research Institute of Chemical Defense (USAMRICD)

USAMRICD has been supporting programs of national interest. Several congressional special interest programs are being managed at USAMRICD. These include Persian Gulf War syndrome, epidermolysis bullosa (a genetic, blister forming disease), and neurotoxin exposure treatment (with special emphasis on Parkinson's disease).

Army Construction Engineering Research Laboratory (CERL)

CERL has been conducting developmental research of recycled-plastic railroad (RR) ties for several years. In 1998, the Chicago Transit Authority (CTA) tested a few of these plastic-composite RR ties in its elevated track. The performance was so satisfactory that the CTA is going out for open bid for 21,500 recycled-plastic composite ties to be placed in both elevated and ballasted track. CERL helped CTA develop the procurement specifications for this project. In support of the EPA Region 5 Office, CERL will help monitor the performance of these new ties and publicize the results.

NAVY

Naval Space and Warfare System Center (SPAWARSYSCEN)

The Navy's SPAWARSYSCEN has established the Center for Commercialization of Advanced Technology (CCAT): \$5.2M of DoD funding for the CCAT went to ONR and then to SSC in FY 01 to establish CCAT. It is a teaming partnership between the government, industry, and academia in the San Diego, CA, area. A cooperative agreement was signed between SSC-SD and San Diego State University. The purpose of CCAT is to identify technologies that have commercial and/or dual-use potential for DoD. The technologies are assessed early in their development to identify candidates for market analysis, linking to a commercial company for production and support in the form of business and market plan development as well as funding. The first solicitation for technologies resulted in the identification of 14 government technologies from SSC-SD and 85 industry and academia technologies. Technologies selected were targeted to crisis/consequence management and missile defense. CCAT is a 2-year program.

Naval Air Warfare Center Training System Division (NAWCTSD)

NAWCTSD has pioneered a new type of partnership arrangement. The Partnership 1 Building, located next to NAWCTSD on Navy-provided land, and constructed with funding from the National Institute of Justice (NIJ) and the University of Central Florida (UCF) was recently completed. It allows joint occupancy (military, academia, and NIJ), and is expected to further collaboration and technology transfer, especially between military and law enforcement activities.

Naval Surface Warfare Center Indian Head Division (IHDIV)

On July 24, 2001, the IHDIV Technology Transfer Office hosted a Technology Showcase, entitled "An Explosion of Technology." The Showcase also was supported by the Maryland Technology Development Corporation (TEDCO). The Showcase was conducted to develop jobs and new business in the state of Maryland. Approximately 500 Maryland businesses were invited to Indian Head for short presentations on

approximately 30 different state-of-the-art technologies, which have been developed for military applications, and are available for commercialization. In addition, laboratory tours were provided to the attendees. As a result of this Tech Showcase, several CRADAs were negotiated, or are under negotiation. Contacts made during this Showcase are continuing to be developed and pursued. The combination of a federal laboratory and state support to develop jobs and create new businesses is important not only for the state but also for the success of the laboratory. It is expected that any commercial product developed either under collaboration (CRADAs) or through patent licensing will help to create new jobs as well as provide commercial products that may be obtained by the DoD for future needs.

Naval Surface Warfare Center Carderock Division (Carderock)

On October 9, 2001, Maryland's Technology Development Corporation (TEDCO), along with the Carderock Division, co-sponsored a daylong series of presentations and tours in West Bethesda, demonstrating Navy expertise in a wide variety of disciplines for potential use by private sector organizations. Through posters and presentations, visitors saw many ways Carderock laboratories and technology can "create the vision" for the 21st Century. With the theme "Maritime Technology for the Marketplace," this event provided information on technology transfer, with presentations illustrating advanced technologies, processes, and facilities.

Naval Research Laboratory (NRL)

At last count, there were over 112 products on the market under license from NRL.

Naval Meteorology and Oceanography Command (NAVOCEANO)

NAVOCEANO, in a CRADA with Interactive Visualization Systems, was able to eliminate an 18-month bathymetric data validation backlog in the first year of the CRADA. This CRADA combined IVS' 3-D visualization software for ocean mapping of large data sets with NAVOCEANO's multi-beam sonar data processing application, Area Based Editor.

AIR FORCE

Air Armaments Command (AAC)

AF AAC CRADA on F-16 Conformal Fuel Tank (CFT) Development with Lockheed Martin Tactical Aircraft Systems was completed during the year. This cooperative effort with Lockheed Martin Tactical Aircraft Systems explored and evaluated the use of conformal fuel tanks for the F-16. With approximately \$8M total value, this is the largest dollar value CRADA ever entered into by AAC. The Air Force will gain an instrumented test aircraft with the ability to conduct conformal fuel tank testing. Lockheed will gain the use of an Air Force instrumented aircraft for test flights. The results of this CRADA will have great impact on Lockheed's foreign military sales program, making them more competitive in a worldwide market and will improve the ability of AAC to conduct future planned tests using the CFT.

Air Force Research Laboratory Materials and Manufacturing Directorate

Composite structure tooling method reduces fabrication times and costs. Engineers and scientists at the Air Force Research Laboratory's Materials and Manufacturing Directorate, the Defense Advanced Research Project Agency (DARPA) and Boeing-St. Louis have successfully developed and demonstrated a new way for significantly reducing the costs of tooling for composite structures. Their new low cost

method lowers the overall bond tool family costs by minimizing the total number of tools in a family; thus, reducing fabrication cycle times. Their new approach is already being used in prototype aircraft programs and could eventually be applied to other major aircraft development and production programs as well, saving millions of dollars while dramatically improving composite structure tooling quality. The application of the new tooling methods for composite structures may lead to significantly reduced tool fabrication costs and span times. There is already widespread use of these methods at Boeing-St. Louis. In fact, bond tools for Boeing prototype aircraft have already been fabricated using this methodology. The new approach is also making in-roads into Boeing production programs such as the C-17.

Air Force Research Laboratory – 3 Directorates

A CRADA was established between the Propulsion, Materials & Manufacturing and Air Vehicles Directorates and Delphi Automotive Systems, LLC to transfer AFRL's "brake by wire" technology to the automotive industry within the next two years. Brake by wire is a next generation braking system that stops vehicles by electrical signals versus the conventional hydraulics systems on cars today. The Air Force's interests are in validating the technology on high temperature power applications, control theory, reliable wiring and connectors for applications on aircraft and other aerospace systems. Cost reduction of components for Air Force systems is another benefit since the automotive industry would buy large quantities, lowering the cost of electric systems. Federal, state and industry dollars are coming together to make this project a fiscal success. Federal dollars total \$1.8 million, the state of Ohio has earmarked \$1 million, and Delphi is bringing forward approximately \$1.2 million.

UNIFORMED SERVICES UNIVERSITY OF THE HEALTH SCIENCES (USUHS)

Antibody Technology – after an assignment of underlying technology to University inventors, USUHS, the Henry M. Jackson Foundation for the Advancement of Military Medicine, and a startup biotech company started by the inventors entered into a CRADA in 1989. Two proprietary vaccines arising under the CRADA are now sold worldwide.

FY 2002 Plan for Conducting Technology Transfer

The DoD views technology transfer as more than simply giving industry access to our laboratory technologies. We are users of the technologies in which we are interested in developing and helping transition into production. Therefore, transferring technology from our laboratories into the private sector and from the private sector into DoD systems is a key element for our Department.

A major part of any program plan involves applying lessons learned to future plans. One of the key lessons learned in the patent program was the realization that patents are often in the very early stages of technical development and therefore it becomes difficult to attract potential licensees. It becomes imperative that the researcher/inventor recognize this and continue to develop their technologies beyond the proof of concept stage in order to attract interest and ultimately capital to continue the technological development needed to transition a technology into a commercially viable product or process.

At some of our laboratories, the trend in CRADAs appears to be moving towards combining CRADAs with license agreements. Quite often, a license agreement is signed on a technology that has been successful through the proof-of-concept stage but needs additional research to bridge the technology gap to where it becomes commercially viable. Since the inventor is the one most intimately familiar with the technology, the signing of a CRADA with the laboratory can be the fastest and most economical way of developing the technology further so the technology and technical expertise underlying the invention can be more readily transferred to the licensee. This can also serve to reinforce the “technology champion” role of the inventor in this process.

As we become better managers of our intellectual property, we are finding that Invention Evaluation Boards at some locations include the ORTA, at others, it does not. The ORTA could provide valuable insight by having a “seat at the table” at those locations where they are not involved currently. Additionally, efforts to protect all inventions throughout the development process must be diligent. Attempts to commercialize one particular innovation led to the realization that the original patent did not adequately protect modifications to the original concept, and the licensing opportunity was lost. This lost opportunity has highlighted the realization that many researchers do not understand technology transfer mechanisms. Several activities are making an effort to provide opportunities such as “lunch seminars” on topics related to technology transfer so scientists have a better understanding of technology transfer and their responsibilities as federally employed scientists.

Technology transfer efforts are not generally included in the planning, budgeting, or execution of Science and Technology programs within DoD. We are seeking to make the technology transfer efforts an integral part of this planning so that as we begin research we consider when to partner with industry and what they might bring to the effort along the way. One example of how we are attempting to reconcile the need to include upfront planning for DoD systems with enhancing the competitiveness of U.S. industry is in the Air Force.

The Air Force Research Laboratory has established 5-Year Strategic Goals for its technology transfer program. The core strategies are: 1) integrate technology transfer into the acquisition strategy – technology transfer programs need to be integrated into the laboratory’s technology roadmaps to bridge resource gaps, 2) identify technologies for commercial application, 3) market resources and technologies, 4) promote technology transfer training, and 5) share Air Force technology with the private and public sectors – the primary benefit of transferring technology is enhancing the accomplishment of the Air Force mission while providing economic and social benefits to the public and private sectors.

Another lesson learned in FY 2001 is that our partnership intermediaries, both TechLink and the Air Force-sponsored PIs, improve the ability to find potential CRADA and licensing partners. Many of our laboratories plan to continue and expand the use of

these resources to highlight top technologies with the highest potential for commercialization. For TechLink, we have established new goals for FY 2002. These new goals include 1) facilitate a minimum of 30 DoD-related licenses, CRADAs, and other partnerships, 2) increase the number of license applications from the region by 25%, and 3) increase the number of companies in the core region submitting DoD SBIR proposals by 25%.

Based on the mission needs of our laboratories, some focus areas for this next year are:

- Marketing: The marketing objective will include not only those technologies identified as having high commercial potential in the market assessment process but also other laboratory resources such as unique facilities, specialized equipment, and in-house expertise. After each marketing event (i.e., trade show, symposium), the ORTA will assess the quality of technology transfer leads to determine the following year's participation at the particular event.
- DoD IR&D: One of the areas on which we plan to build is utilization of the DoD IR&D database maintained by DTIC to identify potential collaborators. This database, which is a means for the private sector to identify its independent research and development activities, has the potential to help match private sector R&D initiatives with DoD laboratory R&D activities for mutual benefit through cooperation.
- Education: Educate scientists and engineers on what to patent and how to patent to ensure maximum protection is obtained for DoD-owned IP. Educate S&Es on the licensing process – what to expect, the pitfalls, time involved, etc., so that they will be prepared for the process.
- Position Descriptions: For those locations where it is not already, seek to ensure technology transfer is a part of position descriptions for laboratory directors, management, scientists, and engineers.
- Defense Information Systems Agency: DISA is supporting a DoD education initiative on several important aspects dealing with equipment donations, information technology management, and partnerships with educational institutions. We anticipate increased activity in this area during FY 2002.

Our overall strategy is to make technology transfer an integral part of the planning process so we can maximize the productivity of our S&T program. However, it must be recognized that future technology transfer activities are directly dependent upon maintaining an acceptable positive return on investment and perceived value-added to the mission. Leveraging resources is a key benefit of technology transfer activities within the DoD. As these opportunities are realized and the benefits are assessed, we anticipate increased usage of technology transfer mechanisms.